

REMARKS

Claims 39, 41, 44, 45, 74, 75, 78, 79, 94, 95, and 96 have been amended. New claims 98 and 99 have been added. No new matter has been introduced by the amendments. Claims 42, 43, 48, 50, 51, 52, 53, 54, 55, 76, and 77 have been cancelled. Claims 39, 41, 44, 45, 46, 74, 75, 78, 79, 80, 81, 82, 83, 94, 95, 96, 97, 98, and 99 are pending in the application (herein referred to as the “'132 application”). Applicant reserves the right to pursue the original claims and other claims in this application and in other applications.

Claims 39, 41, 42, 43, and 46 stand rejected under 35 U.S.C. §102(e) as being anticipated by Laibowitz et al., U.S. Patent No. 6,088,216. The rejection is respectfully traversed.

Claim 39 recites a capacitor having “a first conductive material layer having a first level and a second level” connected by “at least two sidewall regions.” The recited capacitor also includes “an ion implantation doped BST high dielectric constant thin film material having a substantially homogenous stoichiometry formed over said first level, two sidewall regions, and second level,” and “a second conductive material layer over said ion implantation doped BST high dielectric thin film material.” According to the claim, the ion implantation doped BST high dielectric constant thin film material is “a continuous layer at least on said two sidewall regions and said second level.” Applicant respectfully submits that Laibowitz fails to teach or suggest the claimed invention.

Laibowitz discloses a three-dimensional (3D) DRAM capacitor comprising a substrate 12, whereupon a mesa 51 and high dielectric film 56 are formed (Figure 7). Laibowitz, however, fails to teach or suggest a capacitor in which the stoichiometry of the sidewalls is substantially homogenous, as recited in claim 39. Laibowitz discloses a

thin film material deposition technique and resulting structure upon which the claimed invention improves.

Laibowitz discloses a “[h]igh dielectric constant material 66 [] *deposited* to form dielectric layer 67 having a predetermined thickness.” (Col. 3, lines 43-45) (emphasis added). Although Laibowitz fails to state which deposition technique it uses to deposit the high dielectric constant material, it is well known in the art that these materials are generally deposited by chemical vapor deposition (*see* ‘132 application, page 2, line 12 to page 3, line 8; *see also* Declaration of Garo Derderian Under 37 C.F.R. §1.132 (“Derderian Declaration”) at ¶ 21 submitted on January 12, 2004) or conventional sputtering techniques (*see* ‘132 application, page 8, lines 7-9; *see also* Derderian Declaration at ¶ 21). CVD techniques suffer from inhomogeneity in stoichiometry on sidewalls of 3D structures. (See ‘132 application, page 3, lines 9-10; *see also* Derderian Declaration at ¶ 22). Similarly, conventional sputtering techniques result in clumped areas of massed materials having non-uniform thicknesses and stratified layers that are improperly mixed to non-homogenous proportions that are incapable of forming proper average crystals on sidewalls of either trenches or studs. (See ‘132 Application, page 8, lines 7-9; *see also* Derderian Declaration at ¶ 23).

Laibowitz uses conventional techniques of forming its dielectric layer 56 on a sidewall; Laibowitz, therefore, fails to disclose a capacitor having “an ion implantation doped BST high dielectric constant thin film material having substantially homogenous stoichiometry formed over said first level, two sidewall regions, and second level” as recited by claim 39. For at least this reason, Applicant respectfully submits that claim 39 is allowable over Laibowitz.

Claims 42 and 43 have been cancelled. Claims 41 and 46 depends from claim 39, and are allowable along with claim 39 for at least the reasons set forth above. Accordingly, the rejection should be withdrawn and the claims allowed.

Claims 74, 75, 76, 77, 80, 81, 82, 83, 94, 95, and 96 are rejected under 35 U.S.C. §102(e) as being anticipated by Hosotani et al., U.S. Patent No. 6,051,859. The rejection is respectfully traversed.

Claim 74 recites a capacitor having “a first electrode having a first level and a second level” connected by “by at least two sidewall regions” and “an ion implantation doped BST high dielectric constant thin film material having a substantially homogeneous stoichiometry formed over said at least two sidewall regions and over said second level.” Claim 74 further recites a “second electrode provided on said ion implantation doped BST high dielectric thin film material.” The claim further recites that the ion implantation doped BST high dielectric constant thin film material is “a continuous layer at least on said two sidewall regions and said second level.”

Claim 94 recites a capacitor having a “first conductive material layer having a first level and a second level” connected by “at least two sidewall regions.” The capacitor includes an “ion implantation doped high dielectric constant thin film material having a general formula of ABO_3 and having a substantially homogenous stoichiometry formed over said at least two sidewall regions and over said second level.” The claim further recites “a second conductive material layer over said ion implantation doped BST high dielectric thin film material.” According to the claim, the ion implantation doped high dielectric constant thin film material is “a continuous layer at least on said two sidewall regions and said second level.”

Hosotani, like Laibowitz, discloses depositing a thin film material by conventional CVD techniques that suffer from inhomogeneity in stoichiometry on sidewall regions of 3D structures. As discussed above with respect to claim 39 and Laibowitz, Hosotani fails to teach or suggest an ion implantation doped BST thin film material having a substantially homogenous stoichiometry, as recited in claims 74 and

94. For at least this reason, Applicant respectfully submits that claims 74 and 94 are allowable.

Claims 76 and 77 have been cancelled. Claims 75, 80, 81, 82, 83, 95, and 96 depend from claims 74 and 94, and are allowable along with claims 74 and 94 for at least the reasons set forth above. Accordingly, the rejection should be withdrawn and the claims allowed.

Claims 44 and 45 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Laibowitz as applied to claim 39. The rejection is respectfully traversed.

As discussed above with respect to claim 39, Laibowitz fails to teach or suggest a capacitor having "an ion implantation doped BST high dielectric constant thin film material having substantially homogenous stoichiometry formed over [] at least two sidewall regions." For at least this reason, the rejection should be withdrawn and the claims allowed.

Claims 48, 50, 51, 52, 53, 54, and 55 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Laibowitz in further view of Leung et al., U.S. Patent No. 5,563,762. Claims 48, 50, 51, 52, 53, 54, and 55 have been cancelled.

Claims 78, 79, and 97 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Hosotani as applied to claims 74 and 94. The rejection is respectfully traversed.

As discussed above with respect to claims 74 and 94, Hosotani fails to teach or suggest an ion implantation doped BST thin film material having a substantially homogenous stoichiometry. For at least this reason, Applicant respectfully submits that claims 78, 79, and 97 are allowable.

New claims 98 and 99 have been added to round out the scope of the invention. Claim 98 finds support in the specification at page 7, lines 6-9. Claim 99 finds support in the specification at page 10, lines 4-6. As discussed above with respect to claim 94, Hosotani fails to teach or suggest an ion implantation doped BST thin film material having a substantially homogenous stoichiometry. For at least this reason, Applicant respectfully submits that claims 98 and 99 are allowable.

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to withdraw the outstanding rejection of the claims and to pass this application to issue.

Dated: November 19, 2004

Respectfully submitted,

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